

Syndactylie

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Summary

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In this thesis the treatment of congenital syndactyly is described.

The purpose of the study was:

- To evaluate the results of the patients treated in the Academic Hospital of the Free University of Amsterdam in the past twenty years.
- To analyze the different methods used in web construction and in division of syndactylies. In this thesis, the history and evolution of the treatment of congenital syndactylies is described.
- To evaluate the results of the new " double opposing palmar flaps" technique in the treatment of complex syndactyly.

Chapter 1 Introduction

An further explanation is given regarding the purpose of the research in this thesis. In treating syndactyly, the aim should always be to create fingers with a function and an appearance as normal as possible.

Outlined in this chapter are both the definitions of syndactyly and a number of syndactaly-related terms. Also included is a description of the various forms and classifications of syndactyly.

Chapter 2 Embryology

With the assistance of the " Carnegie stages", an outline is given of the embryonal development. Particular attention is paid to the arising of the " interdigital necrotic zones" in which programmed or triggered cell death play a role.

Congenital syndactyly can be caused in two ways:

- through a shortage of lysosomal enzymes leading to insufficient or non-development of the interdigital necrotic zones (intrinsic way),
- through teratogenic factors from outside the embryo (extrinsic way).

Acrosyndactyly is also congenital but is caused by amniotic bands.

The acquired syndactylies usually are the result of burns, crush injuries and scar contractures due to earlier surgery or infections.

Chapter 3 The place of syndactyly in congenital hand deformities.

Classifications of congenital hand deformities can be based on hereditarian or embryological factors, clinical (anatomic) symptoms or a combination of these.

The most frequently used classifications (Frantz and O'Rahilly; Temtamy and McCusick and Swanson) are given. It is Swanson's classification that has been adopted by the IFSSH. The proper place of congenital syndactyly in these three classifications is discussed.

Also in this chapter a distinction is made between syndactyly as an independent deformity and as part of a syndrome.

Chapter 4 Construction of the web.

In constructing the web, one must be aware of possible later contraction of the scar. Described is that therefore the scar should never follow the curve of the web. A summary of the various methods of web construction in the past is given in more or less chronological order.

It is generally accepted that Rudtorffer was the first to publish, in 1808, on the treatment of syndactyly and in particular on web construction. Rudtorffer created an epithelialized tunnel at the base of the future web. Zeller (1810), is believed to be the first to have used a pedicled flap in web con-

struction: the proximal based triangular flap.

Morel-Lavaleé (1849) had a favorable experience by rounding of the edges of two triangular, proximally based flaps and positioning them partially alongside each other. Davis and German (1930) emphasized the importance of the web construction and the fact that different syndactylies require different treatments.

The web constructions published after the introduction of the zigzag-incisions by Cronin (1943 en 1956), are categorized as local transposition-, distant pedicle- or free flaps. Tissue expansion has been used as well.

At the end of this chapter, an outline is included on the various aspects of post-operative management.

Chapter 5 The division of the fingers.

As a rule growth in scar tissue will be diminished compared to normal skin in (little) children. Therefore, a straightline scar in the length of the finger of a child will lead to a deviation or contracture. So grafts and/or zig-zag incisions had to be introduced to solve these problems.

The amount of skin required to span two circles is larger than the amount required for an oval (with the same radius). After dividing the syndactyly, with the exception of the extremely wide and short syndactylies, a skin transplant will always be necessary to help to cover skin defects. A chronological review on the various methods of dividing the syndactylous fingers is given.

Didot (1849) developed two flaps along the length of the syndactylous fingers, to be wrapped around into the defects. Lennander (1891) divided the syndactyly straightly and covered the remaining defects with split thickness skin grafts.

Various authors had already pointed out the danger of straightline incisions along the length of the fingers (Faniel 1911; Zachariae 1955; among others), but it was Cronin (1943 en 1956) who introduced the zig-zag incisions. Millesi (1970) demonstrated the effectiveness of the use of small skin brid-

ges between grafts. Since the beginning of the twentieth century full thickness skin grafts from the inguinal region have been used by the majority of the authors.

Chapter 6 The complex syndactyly.

The complex syndactyly distinguishes itself from other syndactylies through an osseous connection between two phalanges, usually the distal phalanges. Initially all attention was paid to improve the web construction and division of the fingers. Only in recent years interest was directed to the creation of better looking nailwalls, finger tips and nails. In this chapter a review is given of the literature on the various methods to reach these new aims. At the end of this chapter the "double opposing palmar flaps" technique is outlined.

Chapter 7 Patients.

From 1971 to 1992 in the Academic Hospital of the Free University of Amsterdam 82 syndactylies were corrected in 44 children. Results were evaluated of 61 congenital syndactylies in 45 hands of 31 patients. These syndactylies were divided into two categories: complete and incomplete. In the complete group a subdivision was made for the simple and complex type. In three cases split skin grafts had been used. In all three cases scar contraction developed.

The final results of all the treated congenital syndactylies are: 66% good, 25% reasonable, 6% poor and 3% bad. Cases of complex syndactyly treated the conventional way are responsible for all the bad results and half of the poor results. The complex syndactylies treated with the "double opposing palmar flaps" invariably scored good.

Chapter 8 Conclusions and treatment advice.

The conclusions of this study are incorporated in the

treatment advice. The web is constructed either with two proximally based, triangular flaps or with one proximally based, dorsal, rectangular flap. zigzag-incisions are used in dividing the syndactyly.

The complex syndactyly is to be operated in two stages. In the first stage two opposing flaps are raised back to back with the same pedicle on the palm. The loined fingertip and nail are divided equally. The fingertips are flexed into the palm, and the flaps are sutured to the opposite facing defects of the fingers. In the second stage the two flaps are cut free from there combined pedicle and the remainder of the syndactyly is divided.

At the end of both operations a bulky dressing should be applied to the hand and firmly fixed on the arm. If in the post-operative period it becomes apparent that part of the skin graft has not taken, a new transplant has to be applied as soon as possible to avoid excessive scarring and contraction. A prolonged follow-up with regular and frequent control visits is necessary. In cases where osseous deformity, arthrogenic or dermatogenic contractions occur, prompt intervention is indicated.